ANALYZING COMMUNICATIVE SOCIAL INTELLIGENCE USING COMMUNITY OF PRACTICE FRAMEWORK

[1]S.M.F.D Syed Mustapha, [2]T. Nishida

[1]Assoc. Prof., Faculty of Information Technology, University Tun Abdul Razak, Selangor, Malaysia

[2]Professor., Department of Intelligence Science and Technology, Kyoto University, Japan

E-mail: [1]syedmalek@unitar.edu.my;smfdsm@yahoo.com;[2] nishida@i.kyoto-u.ac.jp

ABSTRACT

Knowledge creation has become the primary focus in advance research of knowledge management system. There are few fundamental stages one has to reach before moving comfortably into knowledge creation stage. Social learning is an essential environment in ensuring that social interactions within knowledge management system promote mutual understanding and engagement among members. We use community of practice as the social theory to analyze the advance knowledge management system so-called Communicative Social Intelligence. An analysis has shown that CSI has sufficient intelligent features to support the social learning as prescribed in community of practice.

Keywords: *Information System, Knowledge Management System, Community of Practice, Social Learning Technology*

1. INTRODUCTION

Knowledge creation has become the major focus by the researches in Knowledge Management. Communicative Social Intelligence was introduced as a leapfrog technology in comparison to the traditional Knowledge Management System (KMS). We believe the basic features of any KMS must have is the ability to accommodate effective communication and learning among the communities in play before forging in knowledge creation. Some discussions on the practical aspects of how Communicative Social Intelligence (CSI) can be used as an effective tool in unraveling communication impediments as a result of information disintegration, social strata, domineering effect, cognitive limit and representation style in the scenario of local industry (Syed Mustapha et al, 2003). Learning does not only occur among the newcomers but also among the old timers who have existed in the community for a while. The learning cycle within these two groups will also shape up mutual understanding under the joint activities of common interests. Community of Practice (CoP) is a social learning theory introduced by Lave and Wenger (1991, 1998) that discusses this issue and generally indicates that learning is not only about to acquire tactical knowledge in completing one's task but also understanding the working culture, politics, social structure and so on that exist within the community. Social learning is important for one to adapt oneself into a new environment and how to respond as an acceptable identity.

CSI is built with extended capabilities on three main technological concepts which are the community channel, the dynamic associative memory and the agent-mediated conversational knowledge. The three systems that support each of these technological concepts are the EgoChat (community channel), the CoMeMo (dynamic associative memory) and the POC (agent-mediated conversational knowledge). Literature on these work have been published elsewhere and can be referred for the technical details (Fukuhara et al, 2000; Hirata et al, 1998; Kubota et al, 2002a; Kubota et al, 2000; Nishida et al, 1998).

CoP when originally described was independent from any technological implementation. However, recently there are some critical surveys that discuss design issues using CoP's perspective (Wenger, 2003). CoP describes the kind of events and situations where the learning within the community could possibly take place. Our aim in this paper is to provide some intuition about the usage of CSI as a computational platform in supporting CoP environment. The interesting discussions that we want to address are as follows:

- Can CoP be fully implemented on computational platform such as CSI? What are the limitations and what are the possibilities? What are other technologies available to achieve this?

- What are the learning issues that CSI has prescribed as commended by CoP?

- How can CSI system recognize the existence of CoP among the users of CSI community? What are the evidences traceable by a CoP computer-mediated system?

- What kind of learning environment one must have in order to catalyze CoP environment?

Can CSI detect the emergence of social structure in CoP?.

We address these questions in a holistic manner as they are interrelated and overlapped. In the long run, these questions stir around a global question whether computer-mediated technologies are amenable to the full specifications of CoP. The initial response to this question is to use CSI as the basis computational framework that we have built and subsequently discuss other available tools built around this technology that will support as one robust computational system.

In Section 2.0 we describe Community of Practice (CoP) as the learning theory for community and list sample of CoP evidences, we explain the components of CSI in general aspects in Section 3.0, the analysis of CSI on the aspect of CoP is given in Section 4.0, and finally we conclude the paper in Section 5.0.

2. COMMUNITIES OF PRACTICE

Communities of Practice (CoP) is increasingly to be popular and useful to many researchers in the field of knowledge management. Several works on applying CoP are such as extending community boundary into international and distributed organization (Hildreth, 1998; Kimble, 2001), improving organizational performance (Lesser, 2001), analyzing the social life of digital documents (Murphy, 2001; Seely Brown and Duguid, 1996) and also in ethnography study (Seely Brown, 1991). These literatures are corroborator factors that CoP is a general theory of social learning prone to any implementation of community system. A recent attempt is made by Hildreth et al in implementing CoP in a distributed and virtual working environment. The effort is congruent in supporting distributed organizational setting in today's business model. The distribution concept is different from the one practiced by franchise or branches (such as the insurance agent offices or retail shop) but rather a co-location of virtual teams that work together in producing a similar task (Lipnack and Stamps, 1997). We are motivated in a similar direction in looking at a full-fledge implementation of CoP on a single computational platform. However, we are different from Hildreth in the selections of technologies to be used in implementing CoP. For example, Hildreth still considers using traditional mode of interactions such as telephones or physical meetings as indispensable component of communication in the virtual environment. The major challenge is to build computational technology that will give similar consubstantial CoP effects such as the physical relations conceivable during going out together for lunch, celebrating colleague's birthday or driving home together in a car pool. In CoP, physical relations are important in building mutual trust.

2.1 CoP as social learning theory

We categorize the learning structure currently formed in the traditional mode or supported by computational framework into four types. They are one-to-one as in private tuition, informal teaching between parent and child or as built in intelligent tutoring system, one-to-many as practiced in the classroom, in the seminar room or as in the video conferencing, many-to-one as a new recruit observing the norm practice of an organization through inductive learning or a foreign visitor settled in a new country adapting new culture and many-to-many as two or more delegations from different countries meet to discuss a common issue or merging of two business organizations (the "to" indicates the flow of information from A to B). We believe that CoP encompasses the four aspects of learning structures described above.

Community structure is a major aspect which has made CoP a pervasive theory as far as the members of learning is concerned. Several types of community have been described by Nishida (Nishida, 2000, pp 19) and we would conclude that the boundary of learning community is dynamically resizable depending on the types of community we engage at that particular point of time. The dynamism of community structure yields different learning experience of every individual and

subsequently creates the non-uniformity of individual's response to the community. The community structure can appear in two forms which are institutionalized and non-institutionalized. The former can be formal such as the workplace one is working in or informal such as social club. The latter could be the casual meeting with friends on the street. Community structure also can be composed of not only animated objects such as human and animals but also unanimated objects which contribute to learning. For example, books or articles regarding true crime stories belongs to the same community of CID (criminal investigation department) and claim forms are part of learning objects in the community of insurers and policyholders.

Learning through reification and participation is greatly emphasized in CoP. Reification is the process of congealing one's experience into a concrete form. It can be a form of evidence that social learning has existed. For example, writing a standard procedure of how to process a claim out from vast historical experience is an example of reification. It is wider than just writing rules or procedure as designing, representing, making, building, encoding are also examples of reification process.

Negotiation of meaning is not least in learning issue. In a simple term, the more one performs certain action albeit in repetitive manner, the learning process is continual. That means, a repeating engagement of doing something makes understanding, impression, interpretation, and experience anew for each cycle. For example, our impression or understanding towards a friend changes every time we meet for lunch – whether the relationship improves or deteriorate. An insurance agent negotiates his understanding about a client's protection needs as he deals with more clients everyday.

Learning as a temporal process is another major factor considering the learning history of a community. The progression of community knowledge is an evolution process over certain period. A community makes progress in their thinking or social practices based on the past experiences. For example, how certain procedures or regulations are legalized or abrogated; and why corporate culture is easily absorbed by some society. No one is aware of its evolutions and histories unless he has been in existence since the beginning of the organization. An organization that records its knowledge evolution could avoid repeating unnecessary mistakes or reinventing wheels in decision making.

CoP defines boundary objects as the medium of learning which provides multiple perspectives and interpretations among communities. An object serves different purposes to different group of people and therefore it provides diversified interpretations and views. For example, claim forms can be interpreted by a claim officer as a pile of tasks to be processed on that day. However, a claimer interprets the claim form as a means of redeeming the long term contractual benefit. Brokering is described as importing a perspective earned from different practice and imposed it to a new practice. For example, an underwriter manager may be able to see a wider view of insurance flow operation after s/he has been transferred to another department as a claim manager. S/he may be able to explain that the sources of some claim problems are originated from non-compliance to underwriting requirements at the initial of insurance contract.

Other aspect of boundary is the boundary encounters. Boundary encounters describe three ways how physical visit and interaction can induce learning. Firstly, one-to-one conversation as occur in private communication. Secondly, an immersion which is practiced by training doctors during their housemen. Thirdly, a delegation made by a group to another group in order to exchange ideas and promote understanding.

Participation in a community evolves within the realms of mutual engagement, joint enterprise and shared repertoire. Mutual engagement allows diversity in opinion, difference in group of people, promotes and preserves togetherness in completing a task and upholds mutual relationship. The mutual relationship does not always mean passive conformity but rather commitment to the community even in the form of disagreement, challenge and competition. Joint enterprise is the result of collective participation of the community member due to mutual engagement and therefore generates mutual accountability. For example, a group of claim processors may not be satisfied with the idea proposed by their supervisor which requires each processor to take turn in handling calls from customers (an example used by Wenger). An indication of mutual engagement is furtherance discussion on this issue whether it is agreed or disagreed. The claim processors affected by this new policy emerged among themselves as a new force of joint enterprise. Whatever decision they

may agree upon will be taken as mutual accountability where each will share responsibility and prudentiality in performing the task. Under the mutual accountability, the claim processor is not only responsible for processing the claim but also being prudence in giving explanation to customers' query. Shared repertoires occur when the community establishes some commonness in the words or cliché, approach, gestures, genres or concepts. For example, a senior claim processor has a style that she splits claim forms into simple and complex categories before they are processed have pervaded as a trend to other processors in the department (an example used by Wenger).

We have so far addressed many issues mainly on the community as a whole learning composition. Wenger (1998) has also emphasized the reflection of individual towards the community, so-called identity. Identity differs to one's personality since it depends on factors that influence one's participation, engagement, understanding, appreciation towards a community s/he is involved. While fixed personalities such as caring to small kids or lavish spender are unlikely to change with different environment. However, one's decision to participate peripherally or marginally in a community activity is an identity that a person decides based on the present situation. For example, a newcomer may not give full participation at the inception of social meeting but gradually immerse into full and active member once s/he gets along with the discourse and close acquaintance with the members.

2.2 CoP evidences of existence

The existence of CoP can be recognized merely through making direct observation and having personal experience in an organization. However, in a distributed environment, the evidences are scattered and untraceable. With the introduction of computer technology, some of the evidences are not presentable in a computer form. For example, Alice gets to know John as someone who always offer helps in serendipitous manner by a frequent drop-by at her desk can not be substantiated in computational form even though it is an essential indicator of CoP. Nevertheless, we believe there are many forms of CoP evidences which have equivalent value in proving the occurrences of certain evidences. As far as evidence of CoP is concern, a study on this area has not been given full attention.

In Table 1 we propose to list the main elements prescribed in CoP and suggest the types of evidences or characteristics of evidence in determining the existence of CoP (*Note: the concept of CoP is broad that providing concrete evidence for every possible situation is not possible. We only provide few as samples*).

The evidences given above are observable from the perspective of human cognitive capabilities. An interesting question arises in that can these evidences be detected using any form of computational intelligence.

In the following section, we discuss the technology CSI can offer and subsequently how it can support the existence of CoP and what form of evidences are traceable.

3. COMMUNICATIVE SOCIAL INTELLIGENCE (CSI)

CSI technology extends the traditional concept of knowledge management in three-fold. They are Dynamic Associative Memory (DAM), Community Channel (CC) and Agent-Mediated Conversational knowledge (AMC). Each of these components is explained individually in the subsequent subsections (3.1, 3.2 and 3.3) while the holistic functional view of CSI as a platform for supporting CoP is described in subsection 3.4.

3.1 Dynamic Associative Memory

DAM is a memory representation of the members of the community that they can build easily themselves without a need to have a detail programming knowledge. It is merely an associative network which is built automatically by computer as well as can be manually built in the form of story-telling. We illustrate the idea based on the following simple example.

Alice said "There are three types of insurance we offer which are endowment, life insurance and hospital benefit".

The above sentence will be transformed into associative form as in Figure 1.

If Alice continues to describe her experience further with more sentences, she can construct a form of story-building manually as given in Figure 2.

Alice continues "Many of our customers who are looking forward to make saving as well as protection will choose endowment".
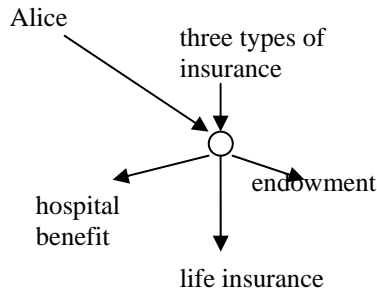

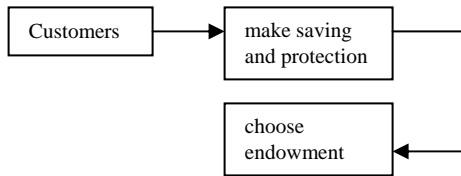*Figure 1: Associative Memory of Alice*

Figure 2: Story-building by Alice

The associative memory is built without the person's consciousness and the structure is rather loosely built. This allows flexibility of future usage as a free-reminder. For example, if someone mention about the types of insurance, Alice memory will pop-up in the conversation to remind the members of the similar issue that has been mentioned. Story-building is more structured and easy to understand. However, the effort of building it can be laborious.dd

3.2 Community Channel

CC is a community channel which allows members of different categories to participate in the community. The categories determine the access level of a member whether s/he can only have view access or create text in the knowledge channel. Since there are many channels for different set of communities, some have full or partial access to all channels depending on one's necessity to be in the respective community. There are three modes of accessibility namely read-only, voting what one likes or dislikes in terms of ideas or argument and submitting the stories. The channels specify the topics to be discussed at the same time one is allowed to appear ubiquitously in several channels that interest him. In this way, one can choose to

have a read-only mode on one channel and mode that allows his stories to be submitted on other channel. For example, a human resource manager wants to have full access to human resource channel while remain as an observer on marketing channel. We illustrate this idea in Fig. 3.

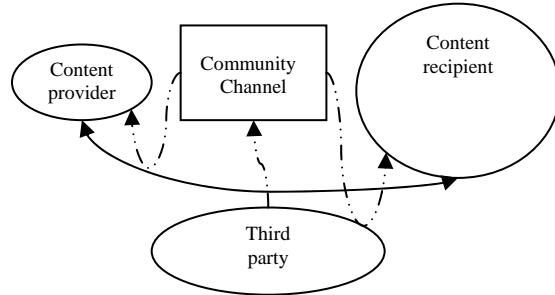A user can play a role as content provider (e.g.

Figure 3: Community Channel

submitting stories), third party (e.g. can only view but not voting opinion) or content recipient (e.g. having full access to read and vote opinion) on different set of community channel. The third party user may be restricted to access to some channel (as indicated by dotted line). However, the content provider and content recipient are designated users who have direct access to all channels (as indicated by solid line).

3.3 Agent Mediated Conversational Knowledge

AMC is a virtual agent that talks on behalf of a member based on the member's personal memory built using DAM. It also presents one's personal experience or ideas stored in a knowledge card (Kubota, 2002b) even though the author of the knowledge card is not present during the conversational session. This allows story edited in asynchronous mode and responded in a synchronous manner which is not possible for e-mails or chit-chat facilities. Stories in the knowledge card may be initially created by a single author but can be collaboratively maintained by several members interested in that topic (Fukuhara et al, 2002). Besides the ordinary text, author of knowledge card can import image file into the card. A collection of stories will turn into a stream of knowledge channel. The strength of virtualized-egos is in the searching of knowledge within the knowledge channel. If one needs to know a concept, a simple keyword will enable one to access it within the knowledge channel and extract the explanation without having to browse through directories of documents. This is equivalent to a

student interrupting his teacher for an explanation on a concept which may be relevant or irrelevant to the current topic of the talk and the teacher subsequently continues the lecture.

Secondly, conversational knowledge process brings about two computer revolutionaries which are conversational medium and conversational content. Conversational medium provides the user with a means for interacting with the content in a conversational fashion and the digital content authored with a conversational medium is called conversational content (Nishida, 2002).

3.4 Communicative Social Intelligence

We illustrate the operational view of CSI as an integrated system in Figure 4. It shows Human A, B and C posted the messages on the community channel. The virtual agents (AMC) navigate the associative memory, search for the closest keywords and post the message back as a response to the recent messages posted by the human or other agent. A voluminous of messages has to be processed such that the relevant messages will be bundled together as a coherent body of messages to be channeled to specific user

4. ANALYSIS ON CSI TECHNOLOGY

The elements of CoP emerge in multifarious forms and continually developed and dispersed over the time. At certain degree, some aspects are seemingly stronger than the others in terms of appearance, existence and occurrences. Therefore, it is not probable to gauge them in measurement unit. It can appear spontaneously and disperse before we manage to discern. The analysis of CoP on CSI is discussed in two manners; CSI as the tool to support CoP and CSI as the tool to catalyze CoP. The former tells that CSI is a generic platform in which CoP environment has to be created and driven by the community. The latter claims that CSI is the driven technology that catalyzes CoP environment. The three technological concepts we discuss earlier focus on three major knowledge generations – story-telling, community building and conversational knowledge. For each of this, we analyze how it corresponds to the CoP evidences discussed in the previous section. Some of CoP elements could be addressed redundantly by more than one CSI component.

Story-telling has been well-accepted as a powerful tool towards knowledge-sharing and knowledge creation (Smoliar et al, 1999). Denning described the success story of highway problem in Pakistan where the solution is obtained within the short time through global networking (Denning, 2000). His theory of story-telling lightens the logical thinking of how power story-telling is. For example, a simple story construct may consist of only 20 words but read by 40 people. Half of them respond to the story with different interpretation and meaning to the story. Within a short period of time, one could appreciate almost 400 meanings and interpretation. Seely Brown explained the tacit knowledge of making left-turn in riding bicycle using physical terms in the form of story-telling (Brown, 2000). His story captures the interest of the audience when he turns subtle tacit physic knowledge into explainable explicit knowledge. Story telling can do more than externalizing implicit knowledge such as entertainment, conveying information, building communities, promote innovation, preserving organizations, changing organizations (Denning, 2000). Nishida's conversation-story spiral model augments the strength of story-telling with conversation (Nishida, 2003). He believes story-telling is stored in archival form which needs to be articulated in interactional form such as conversation. The conversation in this respect could be in the form of face-to-face, over the phone or computer medium such as e-mail or chit-chat board. CSI is also looking at using software agent as intermediary for conversation.

Story-telling is the main boundary object of the community in use. A story which is read by many users triggers different sets of interpretation and perspectives. It is used and appreciated in many constructive ways that the author may not realize when writing it. Mutual engagement can be signified through a series of stories which describe either agreement/disagreement, actualize previous story and redress a devious story. Joint enterprise is formed out of the voluminous stories into actions. The actions are mainly physical ones but also detectable from another set of stories which describe the actions. Within these two sets of shared stories, there are sprinkle of cliché of shared repertoires in which the words may sound bizarre to new comers. The shared repertoires are detectable in the form of short cut words, abbreviated terms, acronym or ellipses whose usage and meaning are exclusive to members.

The stories collected from a certain period of time are simply a form of temporal process of a community learning. They can be aggregated as a coherent knowledge set into a summarize form. Annual report, meeting minutes which are prepared over a period of time are formal learning output compare to informal story collection.

Story-telling also supports negotiation of meaning. Stories are built by individual but maintained collaboratively by a group. The iterative process of knowledge building improves and develops new understanding and interpretation of contextual discourse.

Story-building as in DAM is the process of reification. Members of community can reify their personal understanding through story-building. The personal understanding is the evolution of knowledge development from external sources (such as personal reading, experience, private conversation) as well as the understanding from collection of stories. Story-building is purposely meant to be a manual process as it has equivalent cognitive exercise of an architect designing a concrete house layout of dream house, or programmer designing computer algorithm from an abstract solution. It may be laborious but the ability of realizing one's thought is a proof of concept grasping.

Community channel is an organized electronic forum which provides solid evidence of participation. Members using the community channel are registered which is important in giving out statistical information of participatory pattern. Community analysis is an aspect of Social Intelligence Quantity (SIQ) in monitoring social activities of the participants (Fukuhara et al, 2003). It can detect the members who are the core players in simulating the discussion. It also tells an individual's social information processing activities, interpersonal relationship building desire and monopolized information possessing desire (Nishida, 2003). For example, one may seem to monopolize certain information that interests him or have more control on discourse that he is good at. Participatory information can also be detected qualitatively through natural language processing technique. Word tokenization and tagging over the story text could determine word categories which are harmonious, political, obnoxious, and humorous (examples of these categories are given in Table 1).

Community channel is a platform for an individual to reflect his/her identity as marginal or peripheral participant. An individual may marginally participate as an audience of a channel but peripherally contribute his/her idea. On the other hand, the same person could have different participatory pattern on different channel. This can be portrayed through log-in analysis of an individual of several channels.

Agent-mediated conversational knowledge process (AMC) plays a major role in the negotiation of meaning. For example, a newcomer who is lost with organizational cliché or technical terms that everyone knows can refer to AMC for explanation. In fact, the role of AMC is not only giving out literal meaning of words but what it means in the context of organizational practice. For example, if a word "occupational safety" is entered into the screen, the agent will retrieve the common relevant talk or stories previously posted and converse them verbally in a coherent manner. The user can repeat the same process periodically and may expect different response due to the dynamic changes of the knowledge card. Knowledge card is story compositions which contain the tacit and explicit knowledge of authors (Kubota et al, 2002b).

Brokering can easily occur with the usage of multiple channels in the community channel. In the traditional context of CoP, a brokering occurs when one's physical location changes, s/he accentuates his/her previous experience to the new place. In the context of community channel, the brokering process can take place virtually. For example, members can be registered in several channels at one time. Each channel may manifest different ethics, practices and working principles (we assume this could happen for large and distributed organization). However, these differences are perceptible in the community channel and diffusible amongst the communities. Over a period of time, these differences may reduce as communities learn from each other in adopting the best practice.

Currently the technology in CSI does not support boundary encounters. Boundary encounters emphasize physical visiting such as face-to-face meeting, on the job training or delegation. However, literature has shown some attempt towards accommodating this environment using computer technology. For example, FreeWalk is a project led by Ishida and his group which supports virtual community meeting (Nakanishi et al, 1998, pp 55). The strength of the system is that the community members are freely to move around within the virtual space and form their own smaller social groups. The system still preserves the idea of face-to-face as in video conferencing with additional functions such as free walking. Free walking allows dynamic change of social group members as happened in the actual social gathering. FreeWalk has a promising research direction in which boundary encounters can be implemented

using computational platform. We do not deny that chat room and video conferencing offer advanced tools for distributed communication; however, they do not exhibit the social location of the community. For example, in real social gathering, one's location is important to indicate whether he is about to join the group or just observe from certain distance. Whereas, in a chat room or video conferencing, one's presence is known as he is logging in or seating in front of the web camera. His social movement is not traceable to indicate whether he has moved around to different social group or stayed to one. Social subgroup is not conceivable in chat room or video conferencing in comparison to FreeWalk. Further argument in this can be found in (Nakanishi et al, 1998).

5. FUTURE WORK

Community of Practice addresses the real world issues of human interactions. Building a computational framework that supports CoP leaves a wide range of future work. We suggest three areas of future work which are detecting the existence of CoP within an organization that uses computer system in most of its communication, improving the technology in supporting the full operation of CoP and the evaluation of computational framework in achieving CoP goals. Detecting the existence of CoP is rather complex when interactions occur without the presence of computer system. For example, system must be able to differentiate conversation in a car between colleagues pertaining to office work or common issues. Supporting the full operation of CoP can be complex in the context of distributed working environment. How does a technology compensate John's frequent visit and serendipitous assistant to Alice described earlier in this paper if they are working apart. Evaluation is another area to be explored in quantifying community activities. Social Intelligence Quantity is essential in determining precise meaning of social learning for CoP.

6. REFRENCES

Community of practice has been chosen as the theory of learning as it encompasses a wide scope of learning which takes into consideration of practicality, social structure, political, environment that builds the learning together. It can be taken as criteria in assessing whether organizational learning has taken place. CoP believes that learning encounters mainly through social interaction which is informal and most technical problems are solved through peers-to-peers interaction. The learner

comprehends how to perform a task not mainly through an intensive technical training but through experience and reification. On this basis, we believe community of practice must exist within any organization that inspires to become knowledge creating company. The communicative social intelligence is being analyzed in this paper to examine its capabilities in facilitating CoP environment through selective evidences. Nevertheless, we admit that CSI technologies are not amenable to all CoP elements as some require physical contact as a human being. In a simple example, two loving couples can lose their trust after long time of physical separation. This leaves us a perennial research endeavor and challenge in building modern technologies that promotes social values besides providing merely means of communication.

7. REFERENCES

[1] Brown, J. S. and Duguid, P. (1991). Organizational Learning and CoPs. Organisation Science, Vol 2, No1, pp. 40 – 57.

[2] Brown, J.S. and Duguid, P. (1996). The Social Life of Documents, First Monday, 1(1). http://www.firstmonday.dk/issues/issue1/documents/.

[3] Brown, J.S. (2000) How does a motorbike turns. http://www.creatingthe21stcentury.org/JSB4-motorbike.html.

[4] Denning, S. The Springboard: How Storytelling Ignites Action in Knowledge-Era Organizations by Stephen Denning (October 2000) Butterworth-Heinemann.

[5] Denning, S. (2000) The impact of story-telling. http://www.creatingthe21stcentury.org/Steve7-Impact-of-story.html.

[6] Fukuhara, T., Fujihara, N., Azechi, S., Kubota, H. and Nishida, T. (2000). in Nishida, T., ed. Dynamic Knowledge Interaction. CRC Press, Boca Raton, Fla.

[7] Fukuhara, T., Chikama, M., Nishida, T. A. (2003). Platform for Investigating a Knowledge-Creating Community: Community Analysis and Maintenance Functions in Public Opinion Channel. In Proceedings of the Workshop on Social intelligence Design.

[8] Fukuhara, T., Nishida, T. and Uemura, S. (2002). POC Communicator: A System for Collaborative Story Building. In E. Damiani, R. Howlett, L. jain and N. Ichalkaranje editors. Knowledge-based Intelligent Engineering Systems & Allied Technologies (KES 2002), vol 4 of Frontiers in Artificial Intelligence and Applications, pp 1336-1340, Armsterdam, IOS Press.

[9] Hildreth, P.M., Kimble, C., and Wright, P. (1998). Computer Mediated Communications and International Communities of Practice. Proceedings of Ethicomp'98, March 1998, Erasmus University, The Netherlands, pp 275 – 286.

[10] Hirata, T., Maeda H. and Nishida, T. (1998). Facilitating community awareness with associative representation. In Proceedings Second International Conference on Knowledge-based Intelligent Electronic Systems (KES'98), pp 411 – 416.

[11] Kimble, C., Hildreth, P. and Wright, P. (2001). Communities of Practice: Going Virtual, Chapter 13 in Knowledge Management and Business Model Innovation, Idea Group Publishing, Hershy (USA)/London(UK), pp 220 - 234.

[12] Kubota, H. et al. (2002a). POC Caster: Broadcasting Agent Using Conversational Representation for Internet Community. Trans. Japanese Soc. Artificial Intelligence, vol 17, no 3, pp. 313-321.

[13] Kubota, H., Kurohashi, S. and Nishida, T. (2002b). Virtualized-egos using Knowledge Cards. Seventh Pacific Rim International Conference on Artificial Intelligence (PRICAI-02) WS-5 International Workshop on Intelligent Media Technology for Communicative Reality (IMTCR 2002), pp 51-54.

[14] Kubota, H., Nishida, T. and Koda, T. (2000). Exchanging Tacit Knowledge by Talking-virtualized-egos. In Proceedings of Agent 2000, pp 285-292.

[15] Lave, J and Wenger, E. (1991). Situated Learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.

[16] Lave, J. and Wenger, E. (1991). Situated Learning: Legitimate Peripheral Participation, Cambridge University Press, Cambridge.

[17] Lesser, E.L. and Storck, J. (2001). Communities of Practice and Organizational Performance. IBM Systems Journal, Vol 40, No 4, pp 831 – 841.

[18] Lipnack, J. and Stamps, J. (1997). Virtual Teams. Wiley and Sons.

[19] Murphy, L.D. (2001). Digital Documents in Organizational Communities of Practice: A First Look. Proceedings of the 34th Hawaii International Conference on System Sciences, pp 4005 – 4015.

[20] Nakanishi, H., Yoshida, C., Nishimura, T., Ishida, T. FreeWalk: A Three-dimensional Meeting-place for Communities. Community Computing. (Ed Toru Ishida), John Wiley & Son, 1998.

[21] Nishida, T., Takeda, H., Iwazume, M., Maeda, H., Takaai, M. (1998). The Knowledgeable Community – Facilitating the Knowledge process by Humans and Computers, Keynote address: In Proceedings Second International Conference on Knowledge-based Intelligent Electronic Systems, vol 1, pp 23-32, Adelaide.

[22] Nishida, T. (2000). Dynamic Knowledge Interaction. CRC Press LLC.

[23] Nishida, T. (2003). Semantic Computing with Conversations and Stories. The 17th Annual Conference of the Japanese Society for Artificial Intelligence, pp 1 – 7.

[24] Syed Mustapha, S.M.F.D, Nishida, T and Kubota, H. (2003). *Applying Communicative Social Intelligence in Malaysian Industries*, Conference on Scientific and Social Research, Palace of the Golden Horses, The Mines Resort.

[25] Smoliar, S., Baker, J.D. (1999). Storytelling, Jamming and All That Jazz: Knowledge Creation in the World of New Media. Proceedings of the 32nd Hawaii International Conference on System Sciences, pp 1 – 10.

[26] Wenger, E. (1998). *Communities of Practice: Learning, meaning and identity*, Cambridge University Press.

[27] Wenger, E. (2003). Supporting Communities of Practice: A survey of community-oriented technologies. http://www.ewenger.com/tech/

Table 1: Evidence of CoP elements.

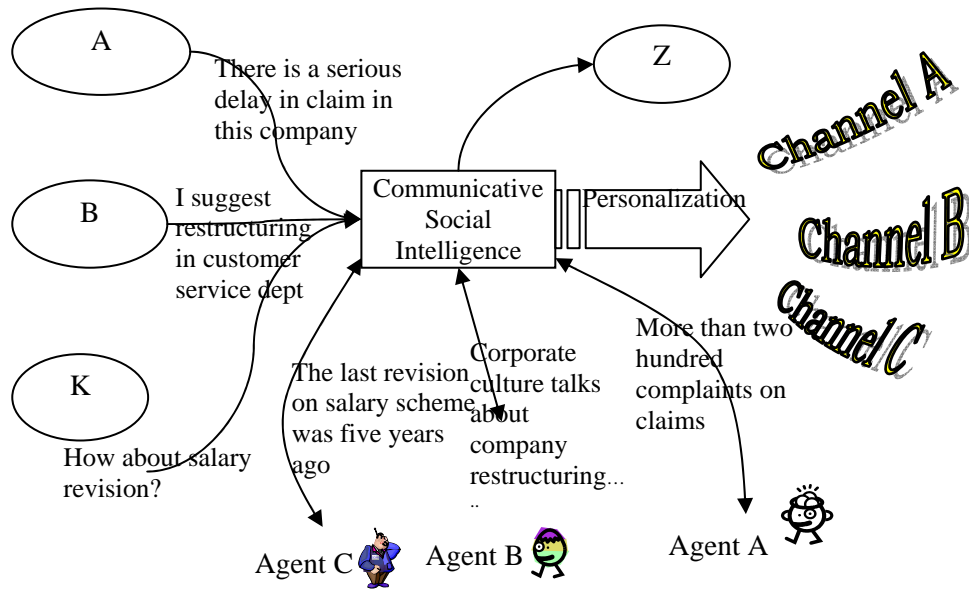| CoP elements	Evidences
Reification	Procedures, rules, forms, summary, report, naming or designing. For example forming a committee or writing computer codes.
Participation	Political words such as "dislikes", "likes", "admires", "support", "agree" etc. Harmonious words such as "having lunch together", "celebrating my birthday", "and visiting my house". Conflictual words such as "…but I can not…", "why you have to do this way", "I have different opinion". Note: More complex evidence will be to show how social communities have influenced a person's thinking.
Negotiation of meaning	Evolution of concept, idea, dream or strategic thinking such as "company's vision/mission or goal statement", "formulating business expansion strategy". Improvising new method of performing a routine work such as "a claim processor categorizes the claim forms in the order of complexity to ease the task (Wenger, 1998, pp 52)".
Learning as temporal process	A collection of messages, meetings, conversations that discuss certain topics and formation of understanding within a period of time.
Boundary objects	Forms of reification that establish relations among communities such as common project, petition of complain or manuals for engineers.
Brokering	Similar working procedure or working styles of two different departments.
Boundary encounters	Personal visit between two individuals in order to know one's job, providing on the job training or making group visit between department or functional groups. Groups of engineers from different organizations working together in troubleshooting similar problem.
Mutual engagement	Telephone calls, going out for lunch together, celebrating someone's achievement, gossips, jealousies and cliques (Wenger, 1998, pp77)
Joint enterprise	A formation of formal or informal group to fight certain right or group of special interest.
Shared repertoire	Common jokes, cliché, abbreviated terms, resources or terms.
Identity	Individual e-mails, contribution of ideas, number of participation in social activities.

Figure 4: Communicative Social Intelligence